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Density Differences: Exploring Built Environment Relationships with Walking Between and Within Metropolitan Areas

Jamie Orrego
Portland State University

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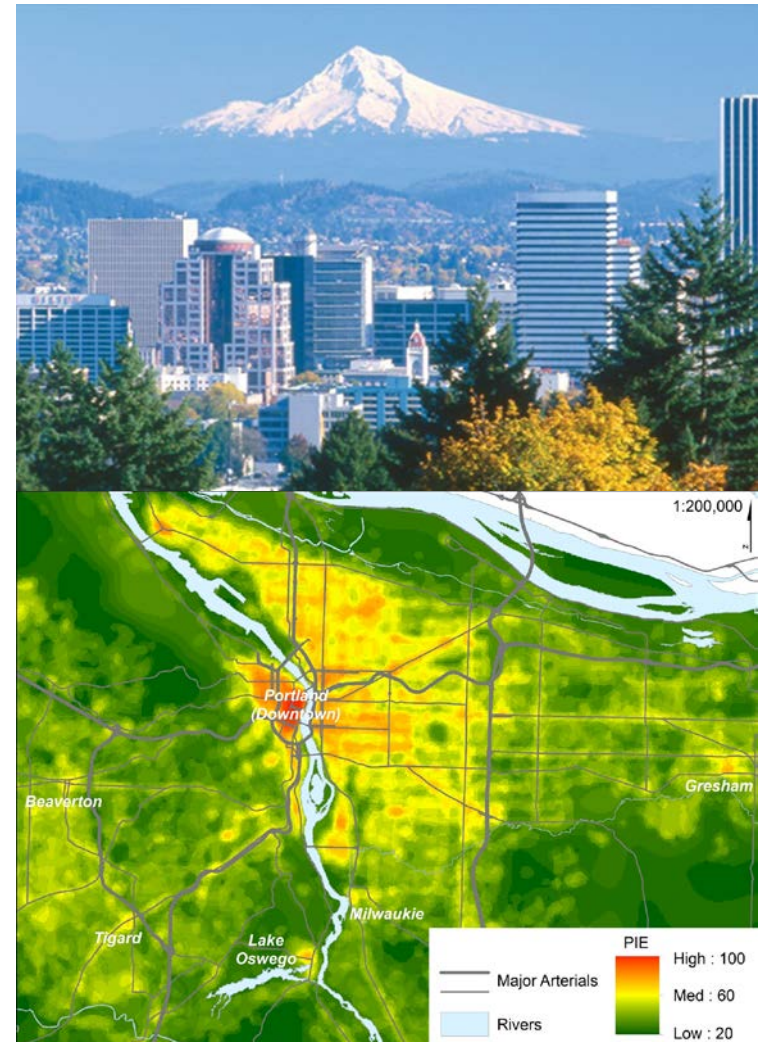
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DENSITY DIFFERENCES: EXPLORING BUILT ENVIRONMENT RELATIONSHIPS WITH WALKING BETWEEN AND WITHIN METROPOLITAN AREAS

Jaime Orrego, Patrick Singleton, Joseph Totten,
Robert Schneider, & Kelly Clifton

Problem

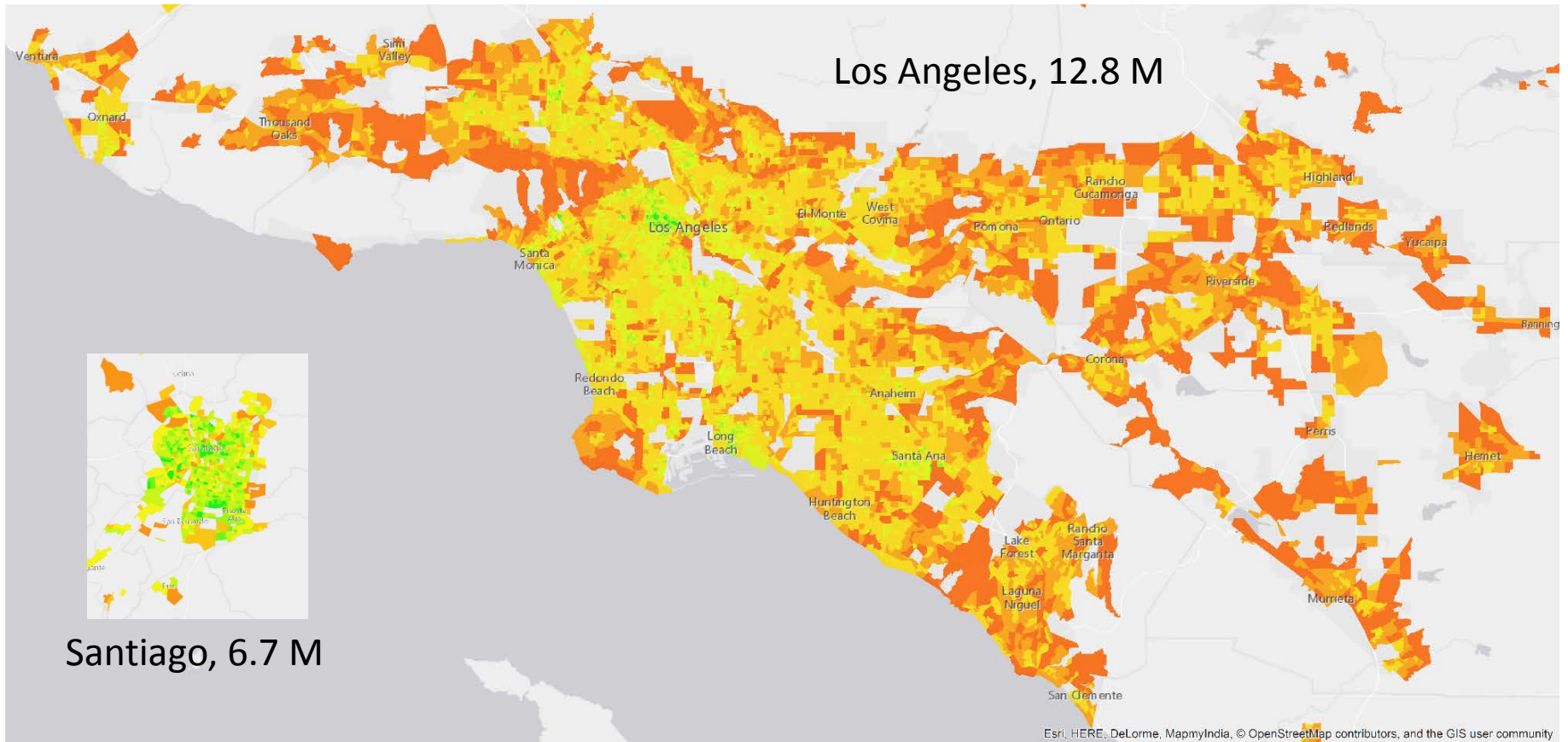
- We have developed pedestrian demand model (MoPed)
- We use an indicator for the pedestrian environment called PIE (score 20-100)
- Can we extend this approach to other cities?



Travel behavior and the built environment

- Assume linear relationships between the attributes of the built environment and travel choices.
- Focus in the whole region not considering the larger urban spatial structure.
- Does the relationship is the same in downtown or in a suburb?
- Does the relationship is the same even if the structure between cities is different?

Different urban structures



Research goals

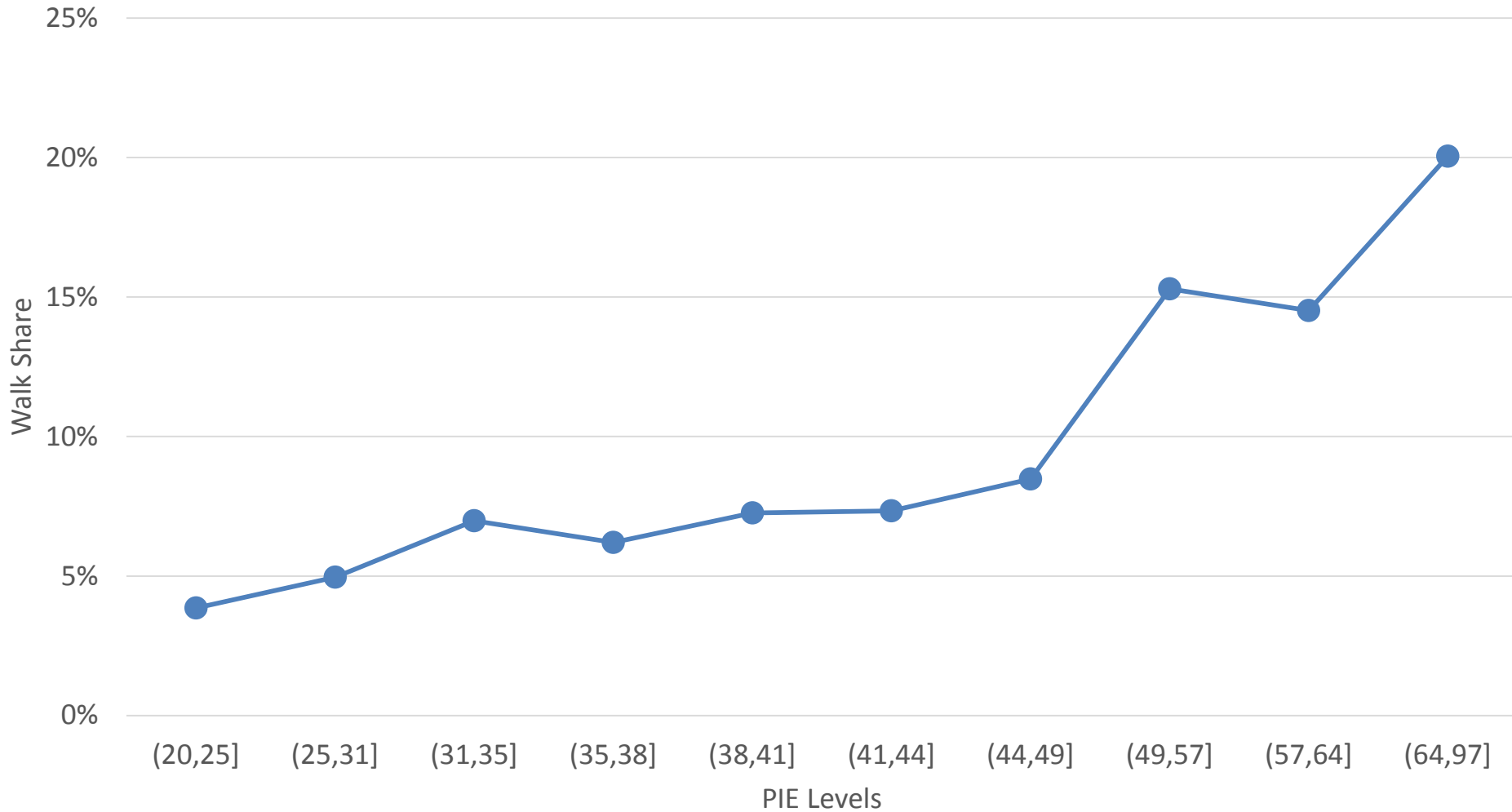
Understand how transferrable measures and models are across various locations

- Are these relationships even applicable within different environments in the Portland region?
- Do the relationships between the built environment and walking in Portland hold in other places?

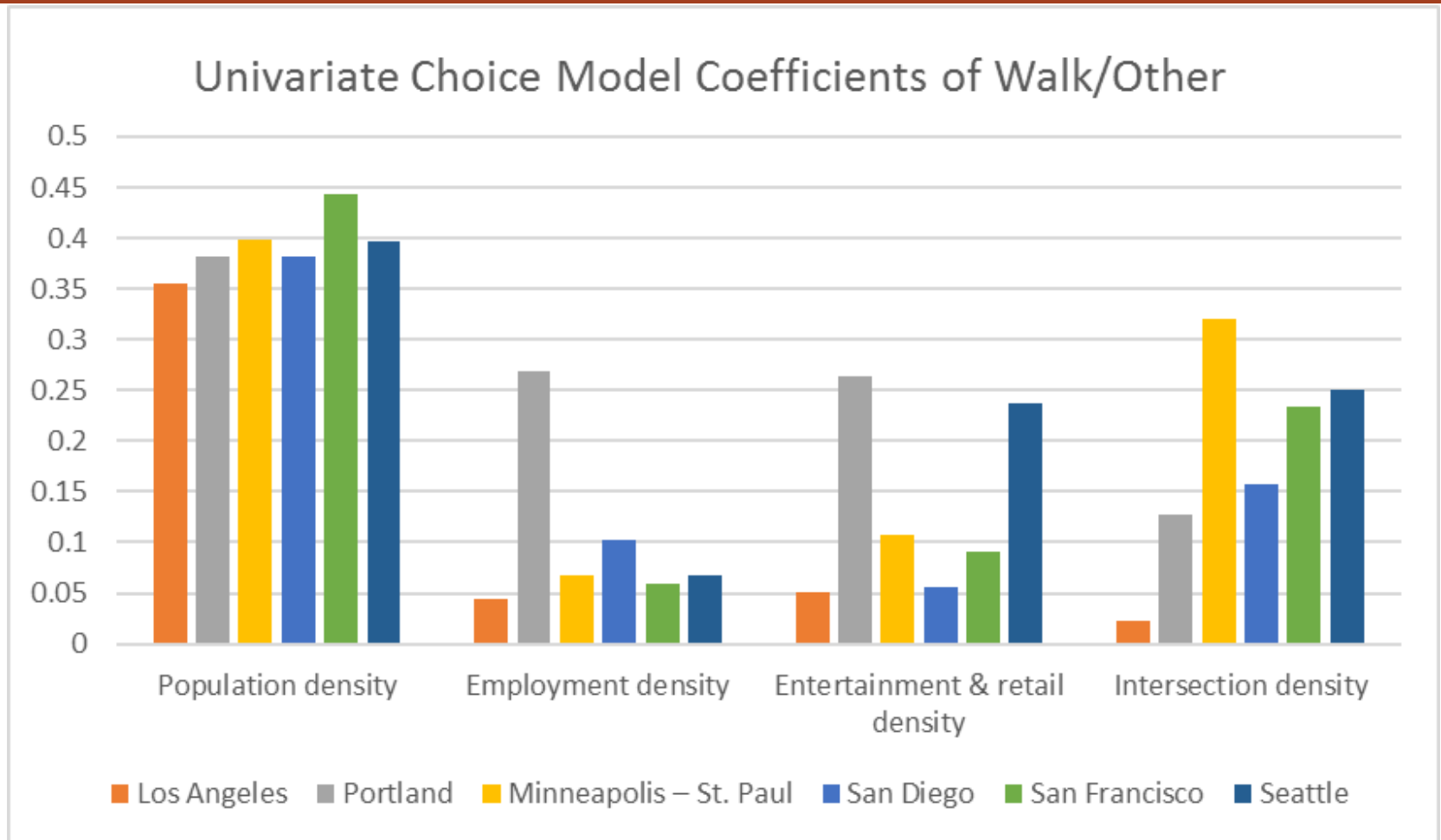
Methodology

1. Construct a unique data set for several metro regions
 - Regional household travel surveys
 - Trip end data
 - Built environment characteristics at block group level
2. Identify the key variables influencing the travel patterns
3. Estimate univariate binary logits for walking related to each key variable
4. Compare results across and within metro areas

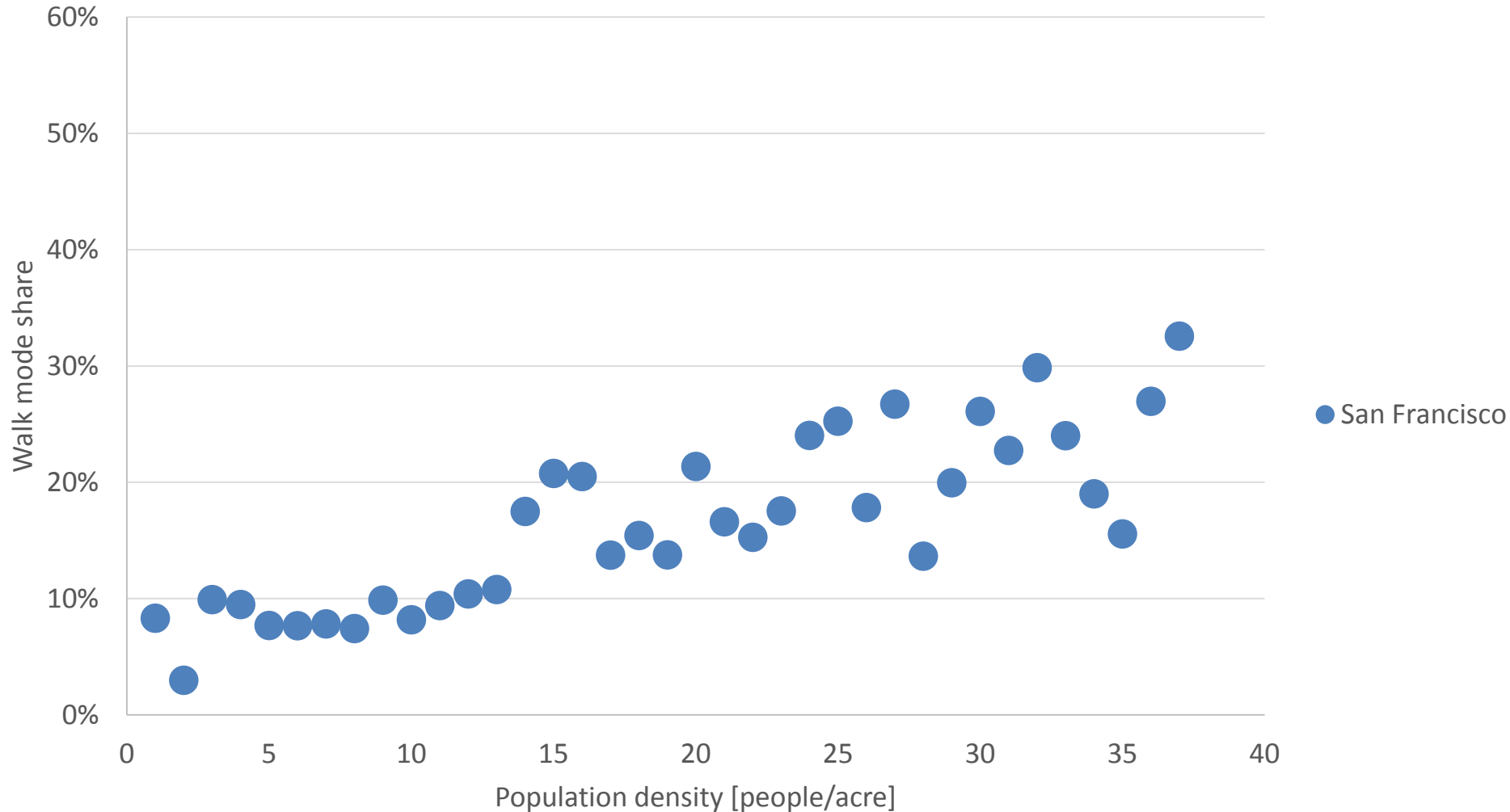
PIE levels and walking share



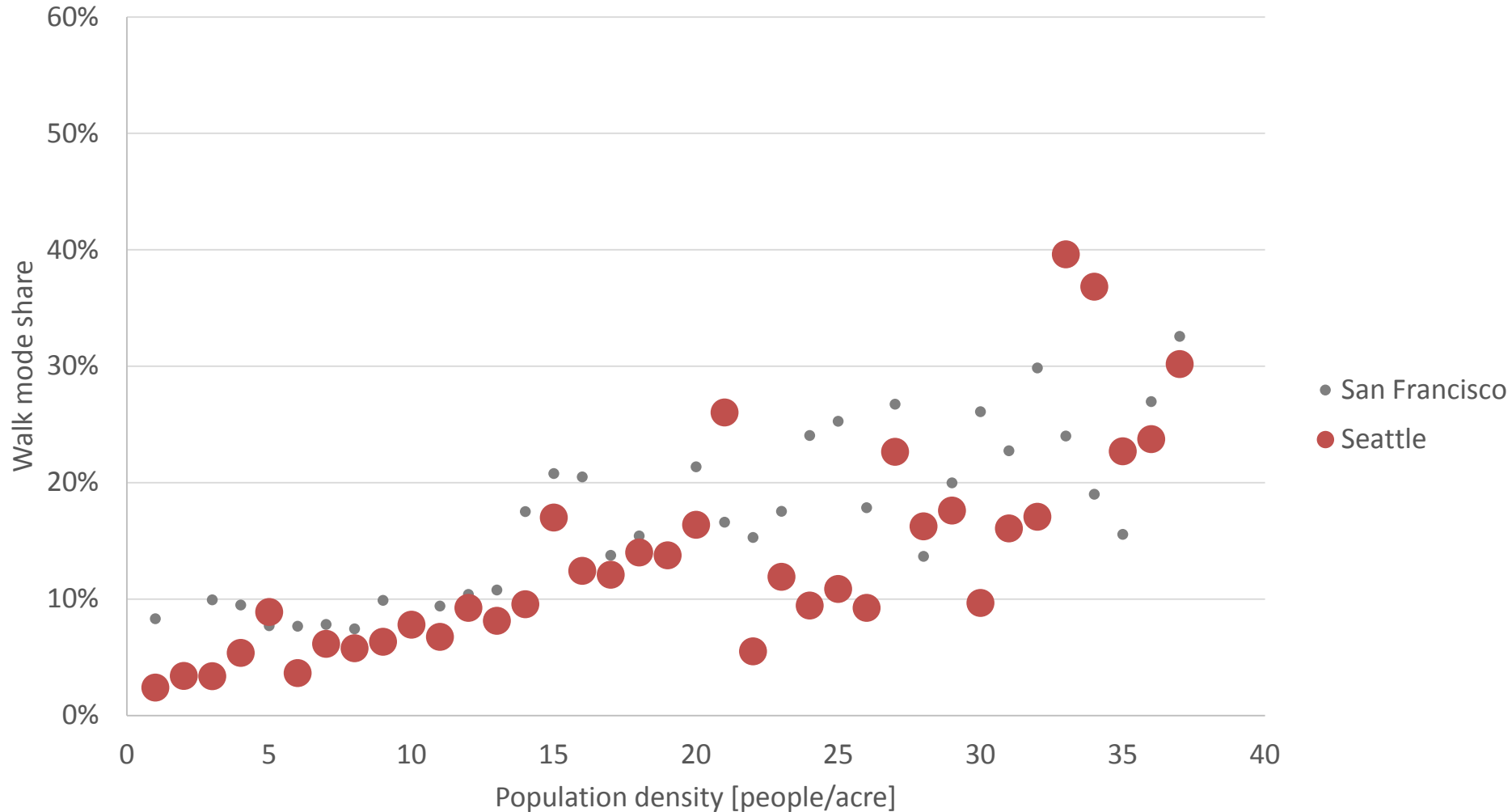
Coefficients estimation



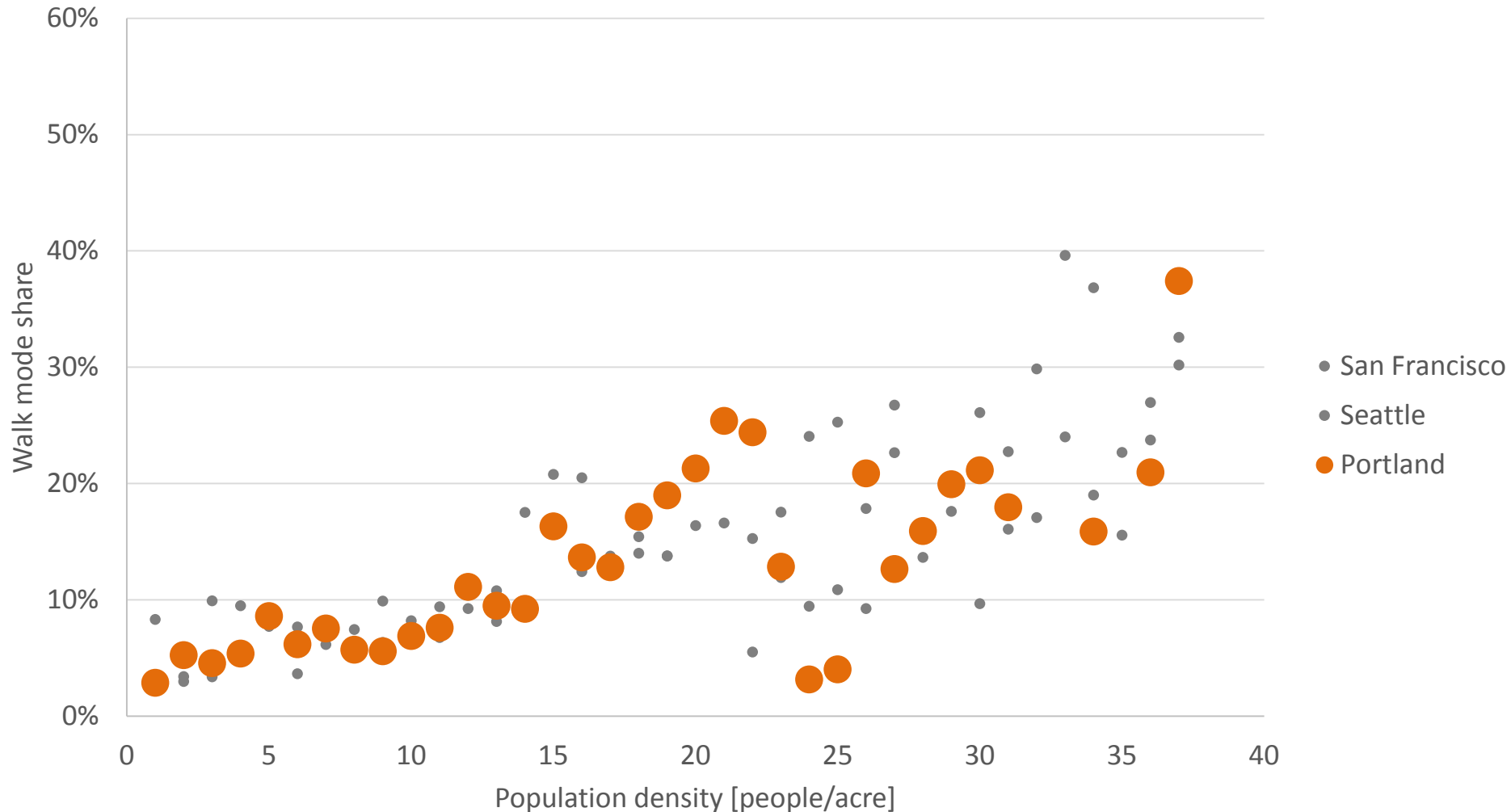
Walk mode share across density levels



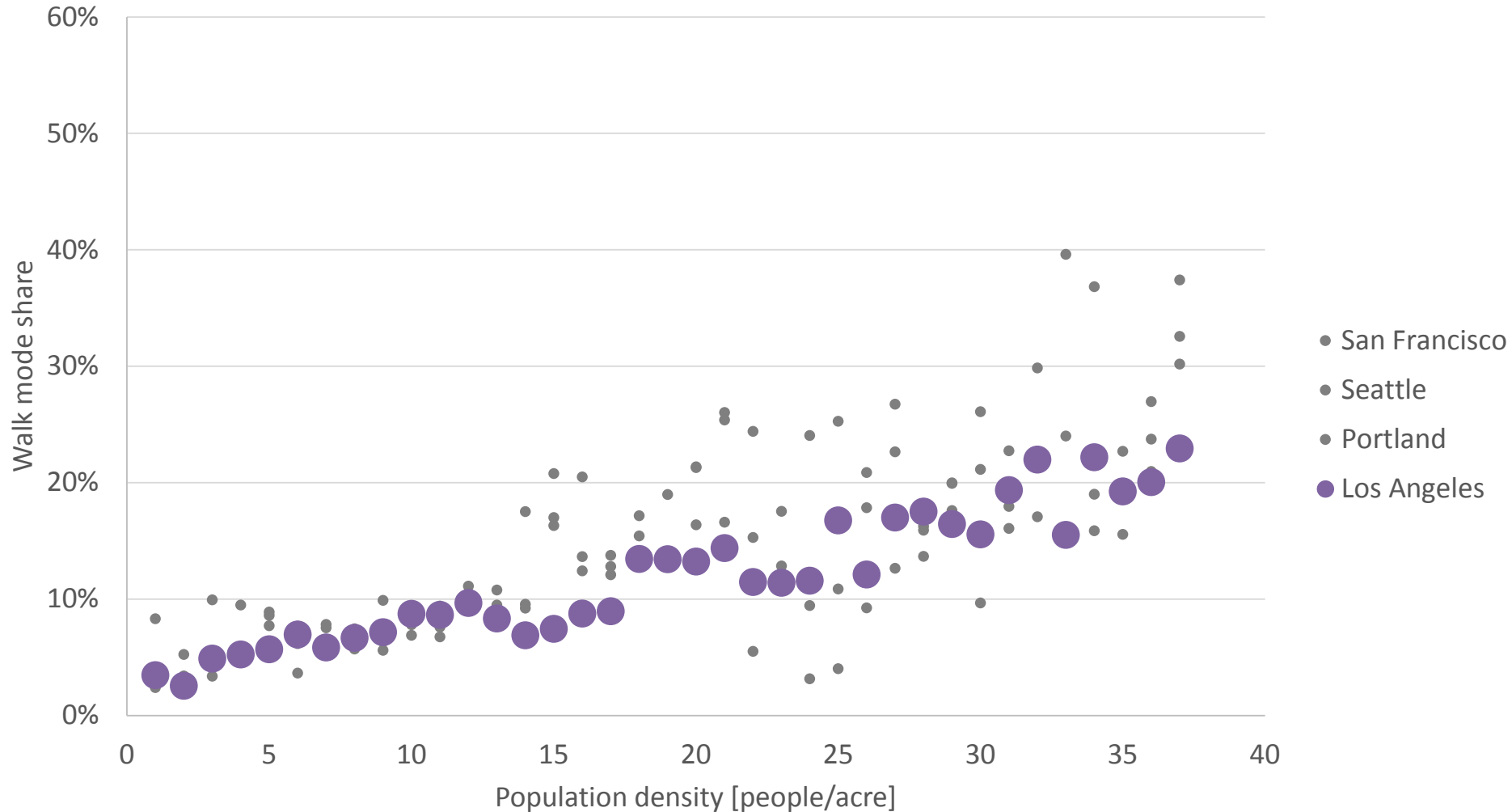
Walk mode share across density levels



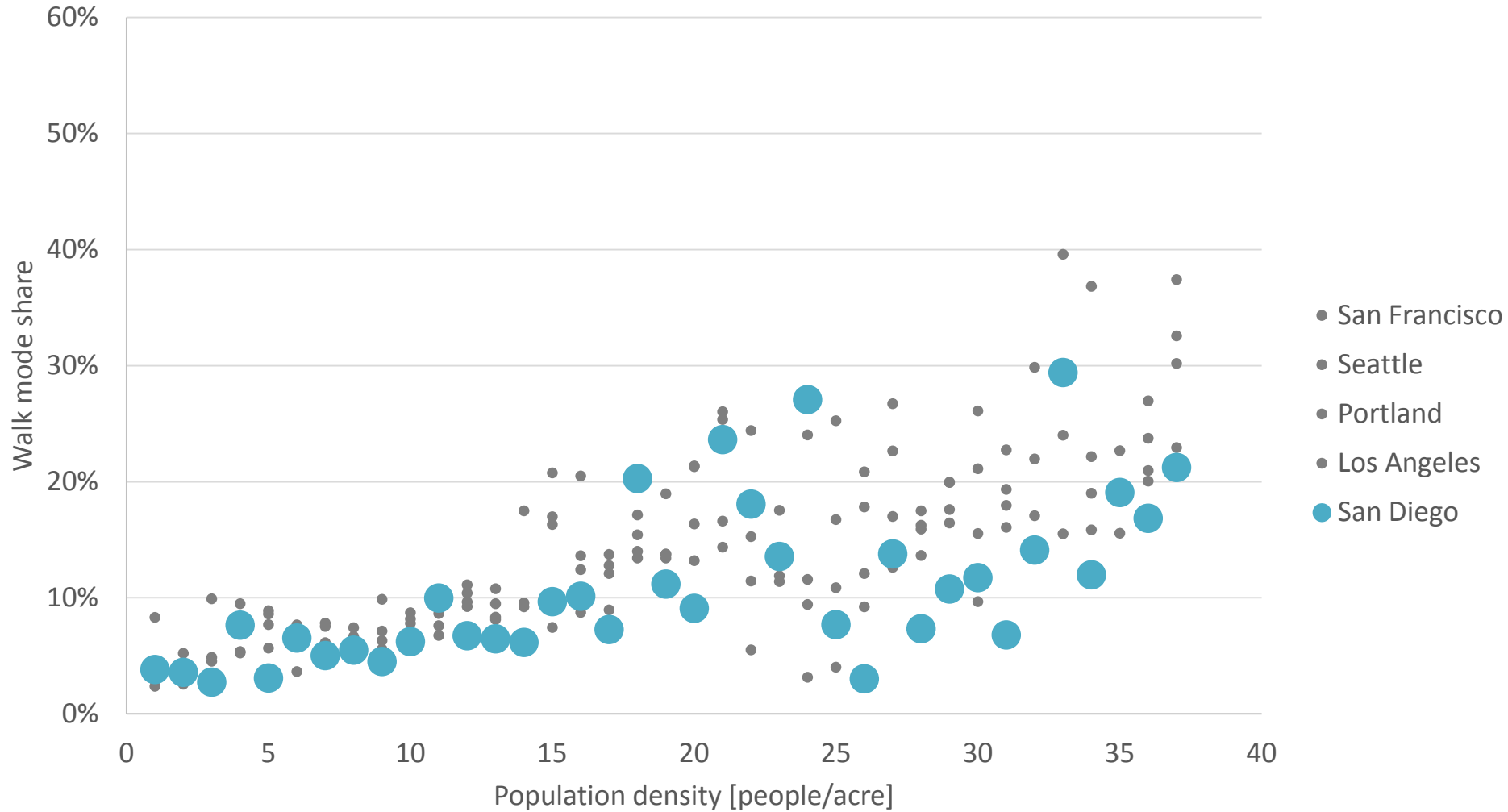
Walk mode share across density levels



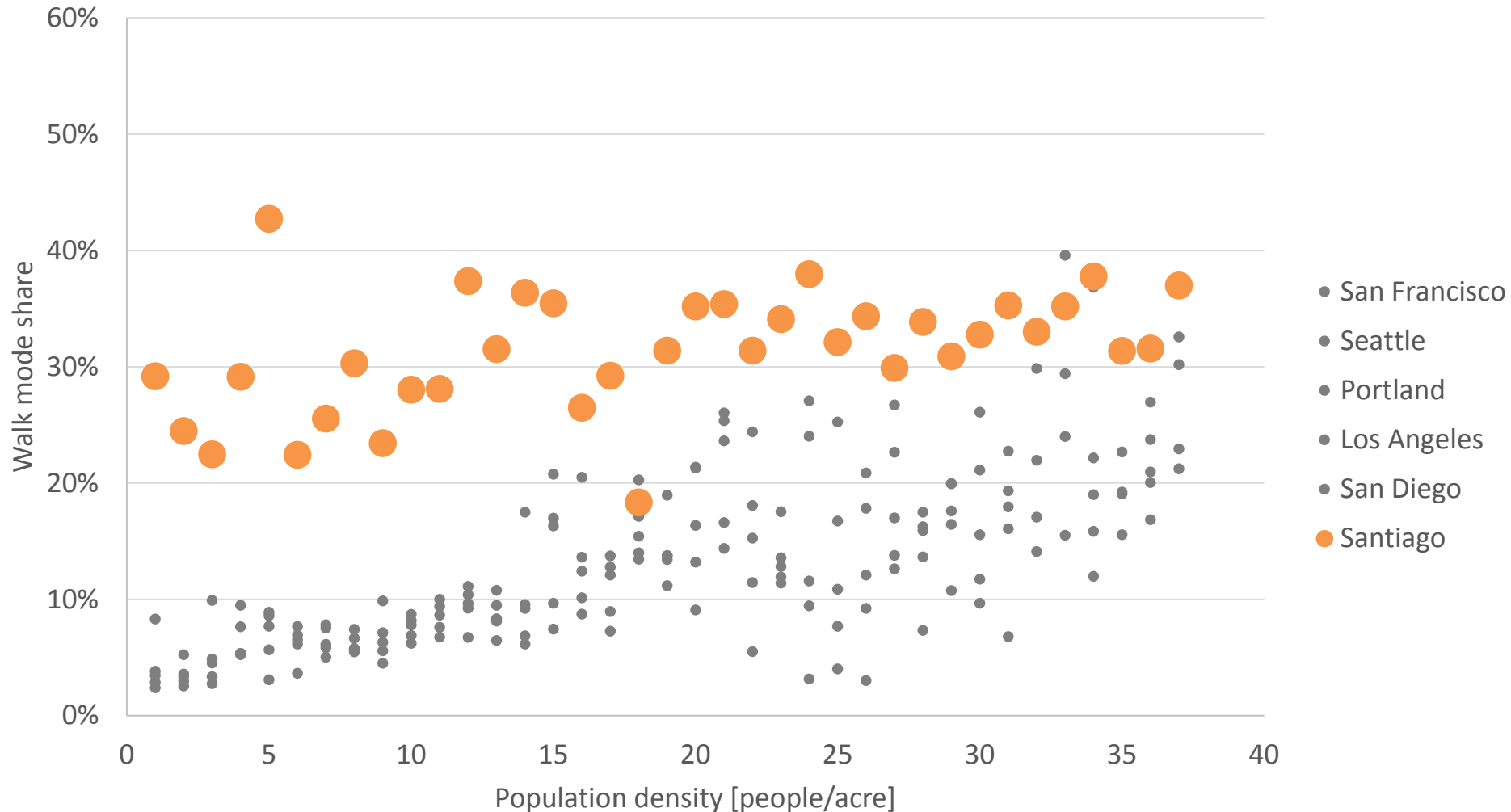
Walk mode share across density levels



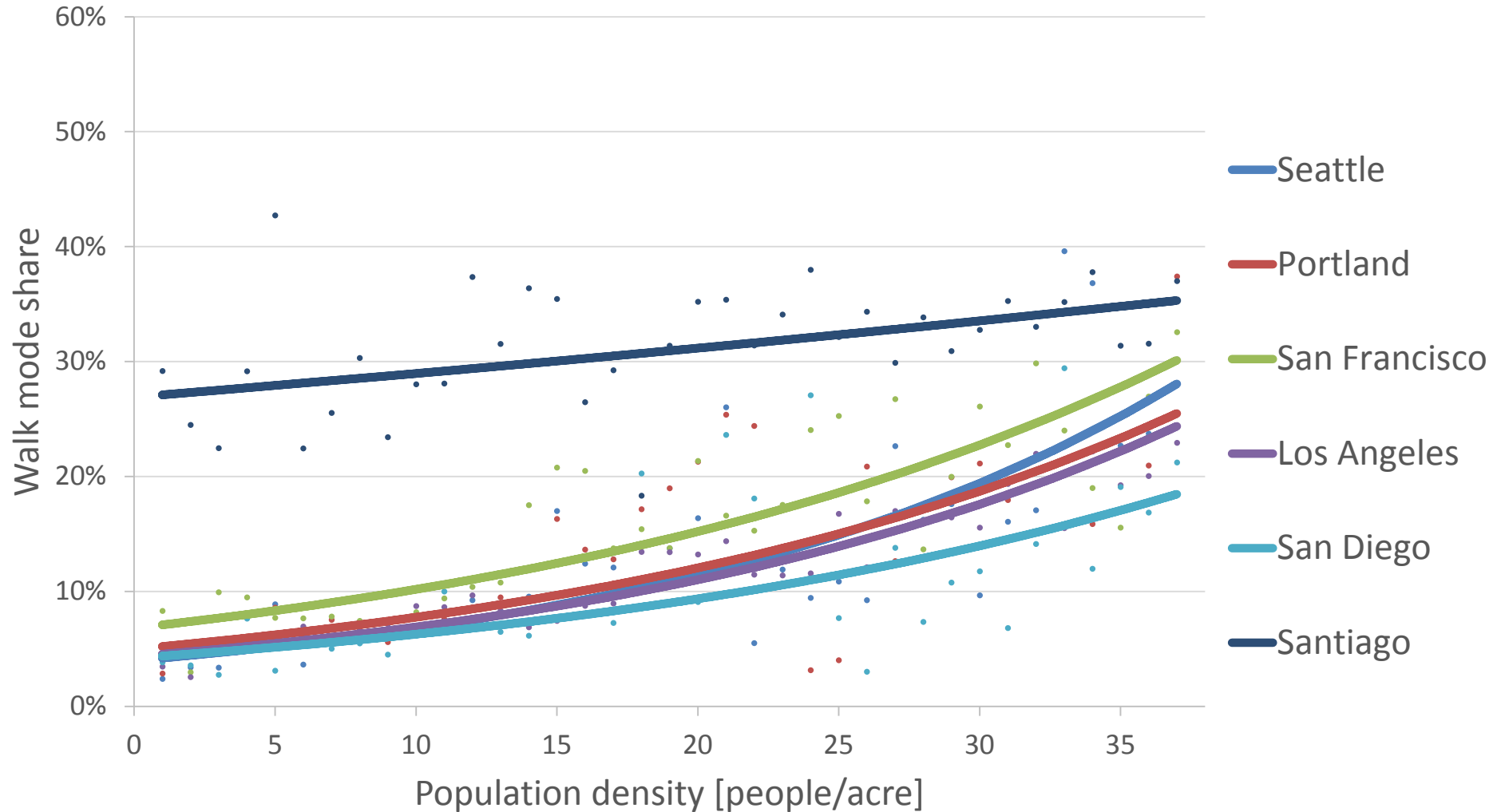
Walk mode share across density levels



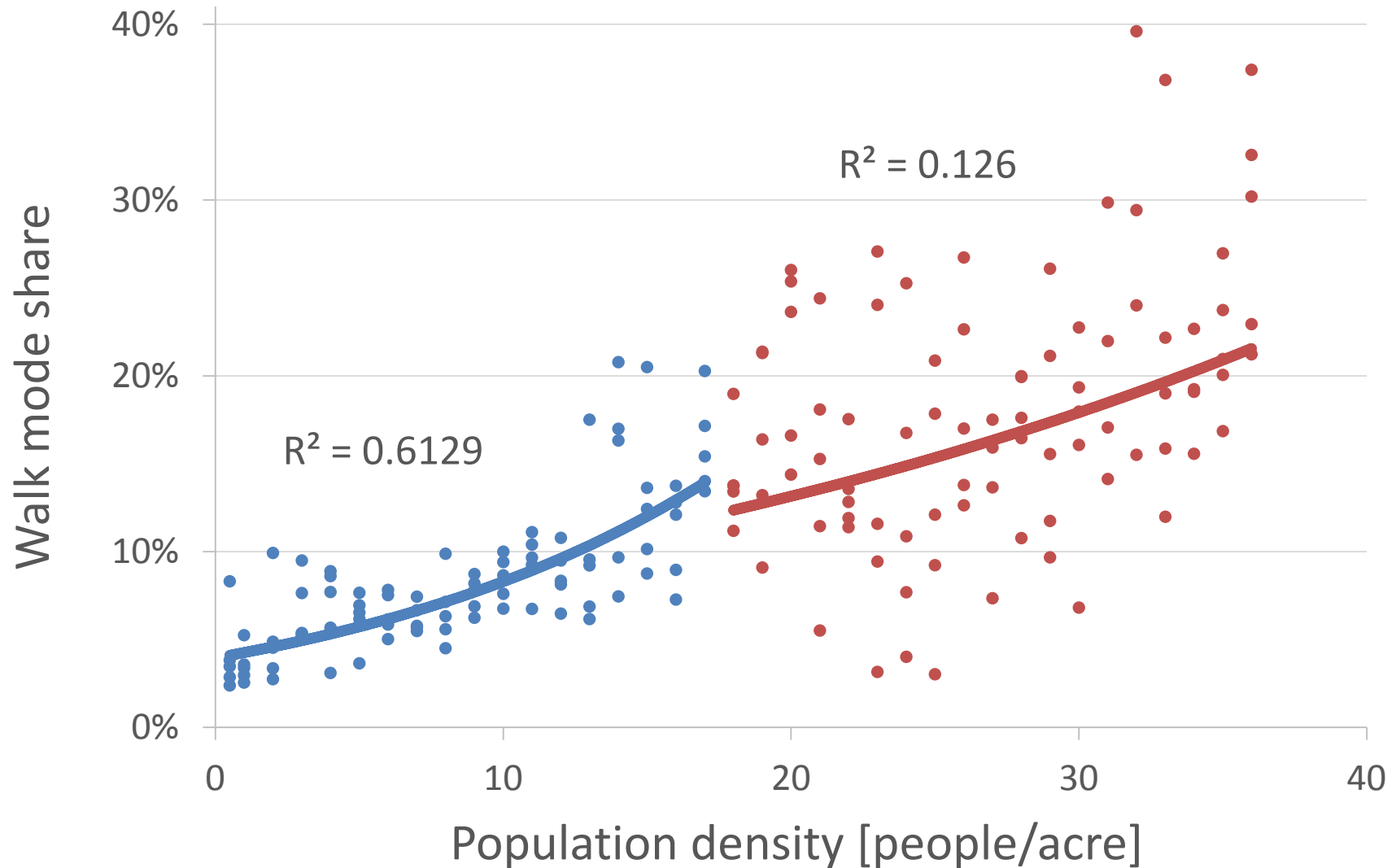
Walk mode share across density levels



Trend lines across density levels



Two different regimes in US cities



Key Findings

- Across US cities, there is variation in relationship between walking & built environment measures across
 - Less variation in population density, the most important explanatory variable. This is consistent with PIE measure and break at score ~50.
 - Employment, retail services and intersection density exhibit more varied relationship to walking across cities
- Within US cities, we identify at least two regimes: Low/high population density environment
 - A positive, linear effect in walking with densities up to 15-25 people per/acre
 - Above that threshold, the effect is less clear. Could have more regimes?
 - Higher density places are not common in US cities (small sample)
- In Santiago, we see less variation in walking with density patterns.

Conclusions

- In terms of travel behavior:
 - Different built environment responses in each city may be due to larger urban spatial structure: density gradients, regional accessibility, polycentricity, spatial extent
 - Nonlinearities exist
 - Cultural and socio-economic differences
- In terms of transferability:
 - Across US cities, suburban areas are most suited to transfer findings, measures, & models
 - In more urban areas of cities, there are differences in the scale (i.e. variation in maximum densities, transit frequencies, etc.)
 - No evidence to show that anything in US compares to Santiago (different regimes?)

Future Work

- Need better representation of households in higher density environments
- Characterize overall urban spatial structure and the distributions of these built environment components
- Test complementarity among BE variables
- Account for these different regimes in our models
- Reconstruct & re-estimate PIE for different regions based upon our findings
 - Some preliminary work already done in Montreal

Questions?

Project info & reports:

<http://trec.pdx.edu/research/project/510>

<http://trec.pdx.edu/research/project/677>

<http://trec.pdx.edu/research/project/1028>